FISH HANDLING AND PROCESSING IN UGANDA

BY

C.M. DHATEMWA
SENIOR FISHERIES OFFICER

Abstract:

It is estimated that in 1987 a total of 141,700 tonnes of fish valued at Shs. 3,850/= million was landed at the shores from Ugandan waters. Most of the fish was consumed fresh in the major towns and around the areas near the shores. The distribution of fresh fish into the interland is restricted by lack of refrigerated facilities and by the poor communication. The remote areas received processed fish and in 1987 it is estimated that 26,387 tonnes of fish was marketed hot smoked, salted or sundried. The fish smoking facilities are still based on the traditional smoke kilns which are wasteful of fuel wood. The smoked fish is packed in large bundles and cushioned in dry grass but losses are inevitable owing to the size of the bundles and the mode of transportation. In the same year 2198 metric tonnes of fish mostly Oreochromis spp, Hydrocynus spp, Lates niloticus and Bagrus spp were salted. Owing to the high cost of salt not enough salt is used and the product keeping time is limited. The smaller type of fish like Rastrineobola spp is sundried whole while species like Lates niloticus, Oreochromis spp and Distichodus are either split open or cut into thin fried in oil in small pieces and consumed immediately while Oreochromis is deep fried in oil for immediate consumption as well as for shor time preservation. Other sophiscated methods of processing like canning have been tried on on experimental basis using Haplochromis spp but since the decline in catches of Haplochromis spp any future work will be focussed on the canning of Lates niloticus in brine.

Introduction:

The total fish production from Uganda waters was estimated in 1987 at 141,700 tonnes valued at Shs. 3,850/= million. The fish production by lake regions was as follows:-

Table 1. Fish Production 1987

Lake Region	Weight in tonnes x 1000	value in Shs. Million
1. Victoria	80.0	2400
2. Albert	8.9	144
3. Kyoga	40.0	1000
4. George/Edward	6.5	169
5. Wamala	0.5	1.5
6. Albert Nile	2.5	4.0
7. Other waters	3.3	132.
Total:	141.7	3850

The fish is distributed in either fresh form or when processed. This paper gives a review of the present fresh fish handling and the various methods employed in processing fish in Uganda.

1. Fresh Fish Handling and Distribution

Fish is caught mostly in gill nets which are hauled into the canoes. The fish is delivered to the shore without any refrigeration and where there are prolonged delays it is subject to deterioration after exposure to direct sun-rays. At the landing the fish is roughly handled and sometimes it is merely dragged long the ground before it is carried to the consuming centres on open pick ups, on bicycles and even by head in baskets. The fresh fish is consumed at the fishing villages and the adjoining areas while the excess is transported to the major town centres which are consuming as well as distribution centres. The distribution of fresh fish is restricted by the absence of refrigeration facilities and the poor conditions of the roads.

The following table illustrates the disposal to selected consuming areas:-

Table 2. Fresh Fish Disposal to Selected Consuming Areas 1987.

Wight in Tonnes

Area	Lates niloticus	Oreochromis Spp	Others	Total
Kampala City	6570	4860	50	11,480
Kampala Ice Plant	65	2	-	8
Jinja	207	276	14	495
Iganga (District)	136	750	12	898
Lira Town	53	10	1	65
Kumi	11	8,5	14,8	24.

N.B. In 1987 Kampala Ice Plant produced 1648 tonnes of ice.

At the fish landings as well as in the markets the facilities for handling fresh fish are completely inadequate. In most cases fish is still handled on the ground and even where there are raised platforms there may be no running water. It is also not infrequent that fresh fish is sold exposed to direct sunrays as there are no shelters. It is therefore not surprising that quite often fish disposed of after more than 10 hrs. exposure is found in advanced stages of spoilage.

The fisheries department, has trained a number of staff who have played a role in improving fresh fish handling particularly in town centres by encouraging the construction of sheltered raised platforms. Where clean water is available the fish traders are encouraged to gut and wash their fish. At Kampala Ice Plant the little fish, that is disposed of there, is either chilled or frozen and the plant has well equipped fish stalls. Under the Integrated Fisheries Development, a project funded by the Italian Government, it is planned to have a cold chain distribution network. This will consist of the main plant at Masese, 3 collecting centres at Lwampanga, Bukungu and Majanji, and 3 distribution centres at Luwero, Kamuli and Mbale. The fresh fish will be distributed in insulated vehicles when either frozen or chilled in ice. Presently there is a private firm which is already filleting and freezing fish and disposes of it to institutions, shcools and hotels in Kampala albeit on a limited scale.

2. Fish Smoking:

Fish smoking is employed as a preservative method as well as a means of imparting a pleasant flavour. Hot smoking is presently the only method employed and the traditional smoke kilns are used. The smoke kiln is basically an excavation in the ground which is about 200 cm long by 150 cm wide and 125 cm deep with one open end. The top is made of steel pipers on which is fixed a chain link over which the fish is packed.

The fish to be smoked is scaled; the large fish are either split open or chopped into roughly 2 kg pieces; the dressed fish is then washed and then allowed to drip dry for about one hour before being packed on the smoke kiln and eventually covered with iron sheets. The smoke is made from wet wood which is known not to impart unpleasant flavours. The fire is gradually increased in intensity and the fish is turned over several times to prevent overcooking and allow even distribution of smoke. The curing process can be for only 6 - 8 hrs giving a soft product that has to be sold off quickly as its keeping time is hardly more than 72 hrs without further drying. Where prolonged smoking process of more than 20 hrs is employed a hard smoked product is obtained and this can keep for more than 7 days before moulding.

The smoked fish is allowed to cook before being packed. The packaging can be in hard card boxes; in bundles which can vary from 40 kg to 500 kg; or the fish may be neatly packed on open pickup which are later covered with water proof material. At its retail outlet smoked fish is often stored in inadequately ventilated areas which are vermin proof. This inevitably leads to losses through spoilage or attack by vermins. The retail facilities for smoked fish also leave much to be desired as the fish is exposed to dust and flies.

The fisheries extension workers have managed to initiate improvements in the handling and processing of smoked fish. The traditional smoke kiln leaves the fish at ground level exposing it to contamination from surface water and domestic animals. The staff have encouraged the construction of the kiln above the ground using mud and wattle or brick walls which is sheltered. This has evolved to a level where the smoke kiln is enclosed in a house which also acts as a fish store. The introduction of the Altona type of kiln not only lead to better quality products but less fuel wood is used. Under the Italian funded project a Chorkor fish smoker (which is similar to the Altona-kiln) is being poularised. A demonstration Chorkor Unit has been constructed at Masese (Jinja) complete with concrete wash basins, drying racks and vermin proof fish store.

The staff have also encouraged the fish processors to hard smoke their products and also to pack their fish into packaging that can be easily loaded on transport vehicles. The obvious benefit would be the reduction of losses on storage and during transportations. At the Fish Technology Laboratory, Entebbe, trials have been carried of smoking fish in combination with brining and a keeping time of two months has been attained. The use grass as a cushion in packaging leads to contamination and transporters are being encouraged to use card boxes but an alternative cushion material is yet to be determined.

Table 3 shows the estimated smoked fish marketed by regions in 1987.

3. Fish Salting:

Salt is employed as a preservative in the fish industry and when it is added directly to the fish in a solid form the method is referred to as dry salting. Dry salting of fish is practised mainly on Lake Albert and the Albert Nile and it involves four types of fish: Ngassa (Hydrocynus spp), Ngara (Alestes spp), Ngege (Oreochromis spp) and the Nile Perch (Lates niloticus and L. macrophthalmus). The Nile Perch are dressed, split open and scored to allow salt penetration.

The brine liquor is allowed to drain away from the heavily salted nile perch whereas the smaller Ngege, Ngara and Ngassa are merely split open, lightly sprinkled with salt and left to dry in the open air. Heavy cures have a salt content of about 35%. Table 4 gives the estimated salted fish marketed by regions in 1987.

The salted fish is often stored in heaps in small stores that are not adequately ventilated. Regular air drying of the salted fish is necessary but sometimes the product is subject to infestation by maggots where insufficient salt has been employed or where drying has been incomplete. It is also common for the product to be attacked by the beetle (Dermestes spp).

The product is packed in 20 kg bundles which may be covered in hession cloth or polythene sheeting. The salted products are consumed mainly in the nothern and western parts of Uganda with some being exported on a barter basis to Zaire across Lake Albert.

The improvements on salted products could be effected through proper dressing of fish and the use of adequate salt. The high cost of salt has limited its application and fish processors have to depend more on good manufacturing practices. This is where the extension workers have laid emphasis.

4. Sundrying:

The traditional air drying of fish makes use of the high temperature and the favourable relative humidity conditions. The preservative action is based on reduction of water content and the corresponding lowering of water activity (a_w).

Sundrying is practised mainly on such small size fish like Rastrineobola Orgentea and Haplochromis spp, which are merely spread in the open air without dressing. The drying process is facilitated by the large surface area/volume ration. The medium size fish like Hydrocynus spp, Alestes spp and Oreochromis spp are split open from the dorsal side, gutted, washed and then allowed to dry. The large size fish like nile perch, and Distichodus spp are beheaded and the flesh sliced into thin sheets which increases the surface area.

This fish is dried by spreading on rocks or on mats laid on the ground and sometimes specially constructed drying racks are used. The spreading of fish on the ground leads to contamination of the product which is invariably gritty. The fish processors have been encouraged to construct drying racks so that the fish is at least off the ground.

Haplochromis spp can also be dried after securing 10 to 20 individual fish on a stick about 60 cm by drawing the stick through the eyes. Ten such sticks are joined together in parallel by string, the whole structure appearing like a mat of fish. The mats are hung in the open air and the fish is allowed to dry over a period of up to six days.

Table 5 shows the marketing of sundried fish by regions in 1987. It should be noted that the Rastrineobola argentea is mainly ground into flour and later incorporated into cereals as animal feeds.

5. Fish frying:

The frying of fish in oil as a method of fish preservation is limited to Oreochromis spp. The fish is dressed in the usual way, scored to allow oil penetration, and the deep fried/oil /in on open sauce pans. The fish is then packed in card boxes and delivered to the consuming centres. The fried fish can be eaten without further processing. The main frying centres are on Lake George and the Kazinga channel and the destination markets are Kampala, Busia and Tororo.

The nile perch has also become a delicacy when fried in oil particularly at social gatherings like beer parties. The fish is cut into small pieces that are deep fried in oil and the fish is consumed immediately.

6. Fish Canning:

At the moment there is no fish canning in Uganda. However, from 1964 to 1967 canning rials were carried on Haplochromis spp by the Fisheries Department. At that time there were abundant stocks of Haplochromis spp in Lake Victoria and the development of such a product was intended to provide:

a) Prolonged storage of fish
b) a substitute for imported canned fish; and
c) possible development of export markets to earn foreign exchange.

There were technical difficulties with the canning process, i.e. the non-uniformity of the raw material being of varous colours, sizes leading to non-uniformity of the finished product; the labour intensity in handling the fish individually particularly when cleaning out the viscera. The process also required a prolonged retorting time. The technical difficulties ruled out the export market and the high cost of the can did not favour local markets. Presently the small harvests of Haplochromis spp cannot justify their canning and future canning trials will be directed on the nile perch.

Discussion and Conclusion:

The handling and processing of fish in Uganda has been left to mainly traditional forms. The fisheries extension workers have tried to initiate improvements in good manufacturing practices and the response from the industry, through slow, is so far encouraging. It is hoped that when the present fish processing projects are commissioned they will have a positive impact by providing the consumer with better quality products. It is also hoped that other fish processors will emulate their new colleagues.

The extension worker can only play an advisory role at the moment. It is hoped that the Law will be amended to make it obligatory for the fishermen, fish processors and fish dealers to provide the consumer with wholesome fish.

****

19 September 1988.

Table 3.

ESTIMATED SMOKED FISH MARKETING BY REGIONS 1987

REGION	SPECIES															
	Lates		Oreochromis		Bagrus		Barbus		Clarias		Protopterus		Alestes		Hydrocynus	
	Wt	Val	Wt	Val	Wt	Val	Wt	Val	Wt	Val	Wt	Val	Wt	Val	Wt	Val
Albert Nile	212.70	51.93	52.30	10.60	13.80	6.37	2.80	0.37	8.10	1.24	8.60	1.19	44.6	7.71	113.4	28.5
Masindi	70.0	12.60	96.10	21.50	8.40	2.00	2.40	0.40	25.50	4.08	2.00	0.40	—	—	168.00	33.80
Tororo	5184.30	907.25	10,126.0	1367.0	—	—	—	—	0.40	0.03	17.10	2.50	—	—	—	—
Mbale	378.30	60.53	128.40	16.69	—	—	—	—	—	—	—	—	—	—	—	—
Kichwamba	—	—	419.0	48.19	334.80	60.26	—	—	28.10	4.36	150.40	18.05	—	—	—	—
Kabale	—	—	394.20	49.28	641.70	128.34	—	—	1663.30	274.44	924.10	120.13	—	—	—	—
Kumi	184.80	25.87	162.0	22.68	—	—	—	—	183.20	29.31	20.02	2.60	—	—	—	—
Masaka	170.40	24.71	23.80	3.80	4.92	0.78	—	—	1.82	0.27	0.60	0.05	—	—	—	—
Jinja	170.60	25.60	158.90	28.60	—	—	—	—	0.50	0.08	0.68	0.07	—	—	—	—
Mpigi/Luwero/Mukono	497.90	72.20	30.30	5.45	17.10	2.65	0.74	0.14	—	—	—	—	—	—	—	—
TOTAL	6869.0	1180.69	11591.0	1573.79	1020.72	196.37	25.94	6.91	1910.92	313.81	1123.5	144.99	44.6	7.71	281.40	62.30

TABLE 4.

ESTIMATED SALTED FISH MARKETING BY REGIONS 1987

SPECIES

Region	Lates		Oreochromis		Bagrus		Barbus		Clarias		Hydrocynus		Alestes		Labeo		Distichodus		Mormy		Synodontis		Auchenoglanis	
	Wt	Val	Wt	Val	Wt	Val	Wt	Val	Wt	Val	Wt	Val	Wt	Val	Wt	Val	Wt	Val	Wt	Val	Wt	Val	Wt	Val
ARUA	8.4	2.94	27.0	6.75	5.0	1.75	0.48	0.11	-	-	82.8	26.91	15.9	5.57	-	-	-	-	-	-	-	-	-	-
MASINDI	210	63.0	1108.8	221.76	163	48.9	8.76	1.75	2.98	0.60	471.2	129.6	36.12	9.93	29.4	5.88	4.8	0.96	3.6	0.54	7.2	0.44	12.9	2.26
	218.4	65.94	1135.8	228.51	168	50.65	9.24	1.86	2.98	0.60	554.0	156.51	52.02	15.50	29.4	5.88	4.8	0.96	3.6	0.54	7.2	0.44	12.9	2.26

Total

	Wt	Value
Arua	139.58	44.03
Masindi	2058.76	529.65
Grand Total Salted	2198.34	573.68

Wt in Tonnes
Value Shs. Million

Table 5

ESTIMATED SUNDRIED FISH MARKETING 1987

Region	Species	Weight Tonnes	Value Shs. Million
Masindi	Lates	23.40	6.10
	Oreochromis Spp	24.42	3.45
	Bagrus Spp	7.0	0.83
	Barbus	0.01	0.12
	Clarias	1.50	0.20
	Hydrocynus	19.35	3.58
	Alestes	35.00	6.65
	Labeo	0.22	0.04
	Distichodus	0.24	0.06
	Hormyrus	0.20	0.04
	Synodontis	-	-
	Auchenognalis	0.10	0.02
Masaka	Rastrineobola	900	6.30
	Haplochromis	0.30	0.03
Jinja	Rastrineobola	6.60	0.80
Tororo	Rastrineobola	254.0	1.80
	Sundried fish Total	1,272.34	30.02

Table 6

TABLE OF PROCESSED FISH 1987

	Total Weight Tonnes	Value Shs. Millions
Smoked fish	22,916.21	3,498.37
Salted	2,198.34	529.65
Sundried	1,272.34	30.02
Total:	26,386.89	4,058.04